ORDER NO. AVS9407883C8

Service Manual

Character Generator

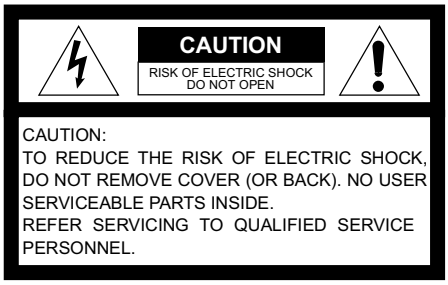
WJ-KB30E

Specifications

Power Source :	9V DC, 100mA
Ambient Operating Temperature :	+5°C - +40°C (41°F - 104°F)
Dimensions :	258(W) X 32(H) X 131(D) mm 10-3/16”(W) X 1-1/4”(H) X 5-3/16”(D)
Weight (without batteries) :	650g (1.43 lbs.)

Weight and dimensions indicated are approximate.
Specifications are subject to change without notice.

Panasonic


CAUTION
RISK OF ELECTRIC SHOCK
DO NOT OPEN
CAUTION:
TO REDUCE THE RISK OF ELECTRIC SHOCK, DO NOT REMOVE COVER (OR BACK). NO USER SERVICEABLE PARTS INSIDE.
REFER SERVICING TO QUALIFIED SERVICE PERSONNEL.

This symbol warns the user that uninsulated voltage within the unit may have sufficient magnitude to cause electric shock. Therefore, it is dangerous to make any kind of contact with any inside part of this unit.

This symbol alerts the user that impotant literature concerning the operation and maintenance of this has been included. Therefore, it should be read carefully in order to avoid any problems.

IMPORTANT SAFETY NOTICE

There are special components used in this equipment which are important for safety. These parts are indicated by the "⚠" mark on the schematic diagram and the replacement parts list. It is essential that these critical parts should be replaced with manufacturer's specified parts to prevent shock, fire, or other hazards.
Do not modify the original design without permission of manufacture.

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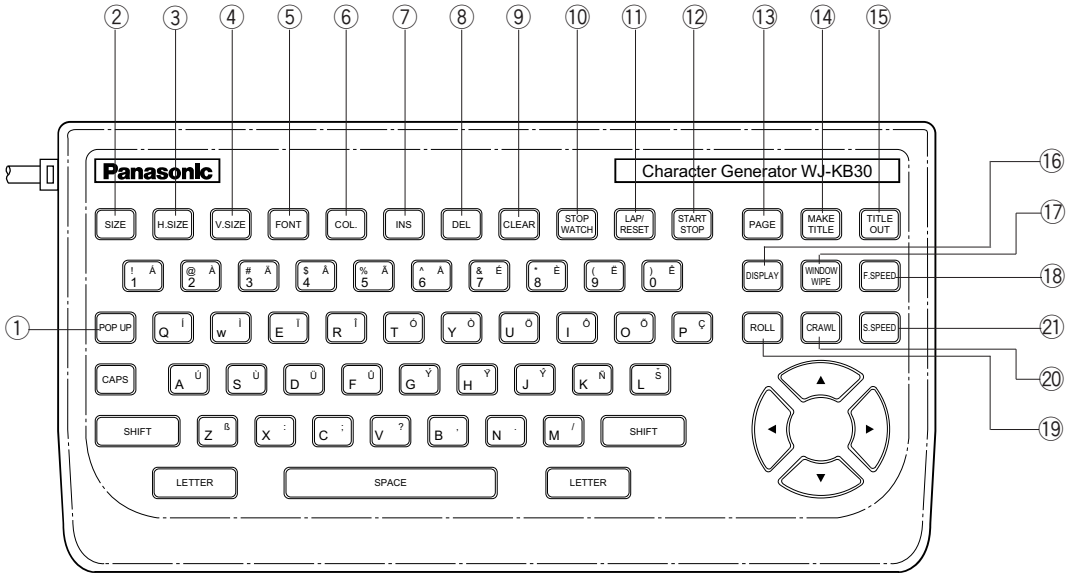
MAJOR OPERATING CONTROLS AND THEIR FUNCTIONS



1. Pop Up Key (POP UP)
2. Size Selection Key (SIZE)
3. Horizontal Size Selection Key (H.SIZE)
4. Vertical Size Selection Key (V.SIZE)
5. Font Selection Key (FONT)
6. Color Selection Key (COL.)
7. Insertion Key (INS)
8. Deletion Key (DEL)
9. Clear Key (CLEAR)
10. Stop Watch Key (STOP WATCH)
11. Lap/Reset Selection Key (LAP/RESET)
12. Start/Stop Selection Key (START STOP)
13. Page Selection Key (PAGE)
14. Make Title Key (MAKE TITLE)
15. Title Out Key (TITLE OUT)
16. Display Key (DISPLAY)
17. Window Wipe Key (WINDOW WIPE)
18. Fast Speed Selection Key (F.SPEED)
19. Roll Key (ROLL)
20. Crawl Key (CRAWL)
21. Slow Speed Selection Key (S.SPEED)

Make Title Mode

Key		+ Shift
PAGE (13)	Page selection	Initialize of selected page
SIZE (2)	Character size selection	Character size selection on a line
V SIZE (4)	Character's vertical size selection	Character's vertical size selection on a line
H SIZE (3)	Character's horizontal size selection	Character's horizontal size selection on a line
FONT (5)	Font selection	Font selection on a line
COLOR (6)	Color selection	Color selection on a line
INS (7)	Insertion/Overwrite selection	Line Feed
DEL (8)	Character deletion	Line deletion
CLEAR (9)	Page reset	All page reset
CAPS	Capital letter/small letter selection	
▲	Upward movement of cursor	Upward adjustment of character position
▼	Downward movement of cursor	Downward adjustment of character position
◀	Leftward movement of cursor	Leftward adjustment of character position
▶	Rightward movement of cursor	Rightward adjustment of character position
POP UP (1)	Special character input	Special character continuous input

Title Out Mode

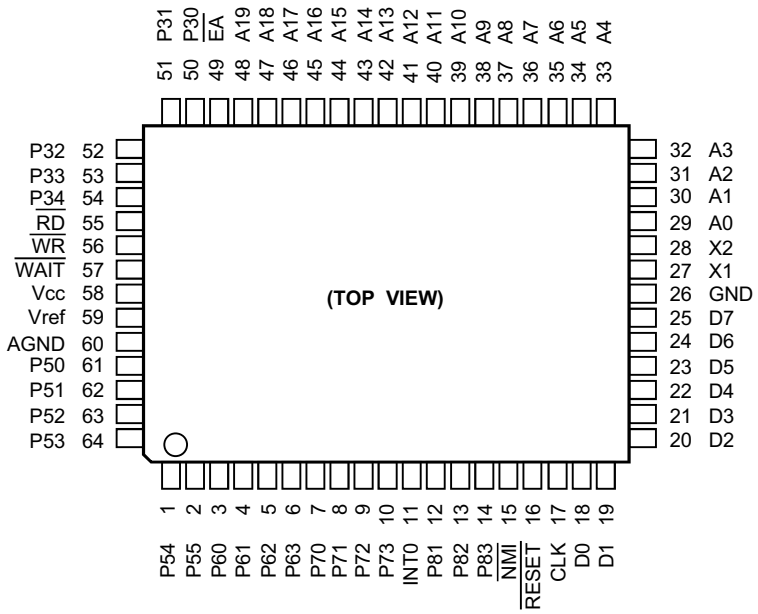
Key		+ Shift
Numeral	Page selection	Page setting for Roll and Crawl
DISPLAY (16)	Display/Stand-by selection	One by one display
▲	Upward scroll	Upward wipe
▼	Downward scroll	Downward wipe
◀	Leftward scroll	Leftward wipe
▶	Rightward scroll	Rightward wipe
WINDOW WIPE (17)	Window wipe operation	Curtain wipe operation
ROLL (19)	Roll operation	Endless roll operation
CRAWL (20)	Crawl operation	Endless crawl operation
S. SPEED (21)	Speed down	
F. SPEED (18)	Speed up	
SPACE	Stop/Reoperate selection	
STOP WATCH (10)	On/Off selection	
LAP RESET (11)	Lap/Reset selection in stop watch on mode	
START STOP (12)	Start/Stop selection in stop watch on mode	

Note: **Initialize means;** Set all conditions except character information to default.
Reset means; Set all conditions to default.

CIRCUIT DESCRIPTION

IC Description

1. IC1 on the Main Board is using the 8-Bit Microprocessor IC TMP90C041AF.
Description of this IC is as follows:



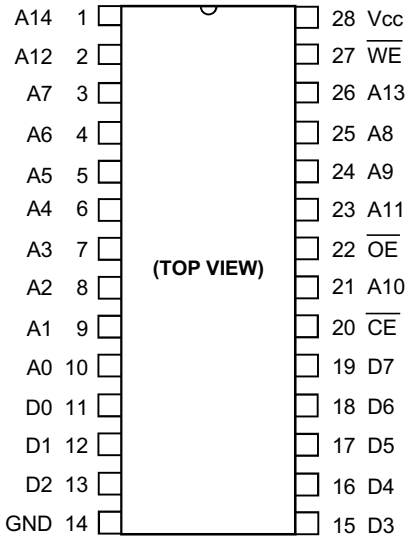
Pin	Name	I/O	Description
1	P54	I	Key Scan signal input terminals. (8-Bit)
2	P55	I	
3	P60	O	Key Scan signal output terminals. (9-Bit)
4	P61	O	
5	P62	O	
6	P63	O	
7	P70	O	
8	P71	O	
9	P72	O	
10	P73	O	
11	INT0	I	VSYNC signal input terminal.
12	P81	I	HD signal input terminal.
13	P82	I	FLD signal input terminal.
14	P83	O	TP3 terminal.
15	$\overline{NMI}$	I	NMI signal input terminal.
16	$\overline{RESET}$	I	Reset signal input terminal.
17	CLK	O	TP4 terminal.
18	D0	I/O	Data input/output terminals. (4-Bit)
19	D1	I/O	
20	D2	I/O	
21	D3	I/O	

Pin	Name	I/O	Description
22	D4	I/O	Data input/output terminals. (4-Bit)
23	D5	I/O	
24	D6	I/O	
25	D7	I/O	
26	GND	–	Ground terminal.
27	X1	I	Crystal Oscillator connecting terminals.
28	X2	O	
29	A0	O	Address signal output terminals. (20-Bit)
30	A1	O	
31	A2	O	
32	A3	O	
33	A4	O	
34	A5	O	
35	A6	O	
36	A7	O	
37	A8	O	
38	A9	O	
39	A10	O	
40	A11	O	
41	A12	O	
42	A13	O	

Pin	Name	I/O	Description
43	A14	O	Address signal output terminals. (20-Bit)
44	A15	O	
45	A16	O	
46	A17	O	
47	A18	O	
48	A19	O	
49	$\overline{EA}$	I	$\overline{EA}$ signal input terminal.
50	P30	I	Key Scan signal input terminals. (8-Bit)
51	P31	I	
52	P32	O	TP2 terminal.
53	P33	O	Key Scan signal output terminals.
54	P34	O	TP1 terminal.
55	RD	O	Read signal output terminal.
56	$\overline{WR}$	O	Write signal output terminal.
57	$\overline{WAIT}$	O	Wait signal output terminal.
58	Vcc	–	Power supply terminal.
59	Vref	–	Reference voltage terminal.
60	AGND	–	Ground terminal.
61	P50	I	Key Scan signal input terminals. (8-Bit)
62	P51	I	
63	P52	I	
64	P53	I	

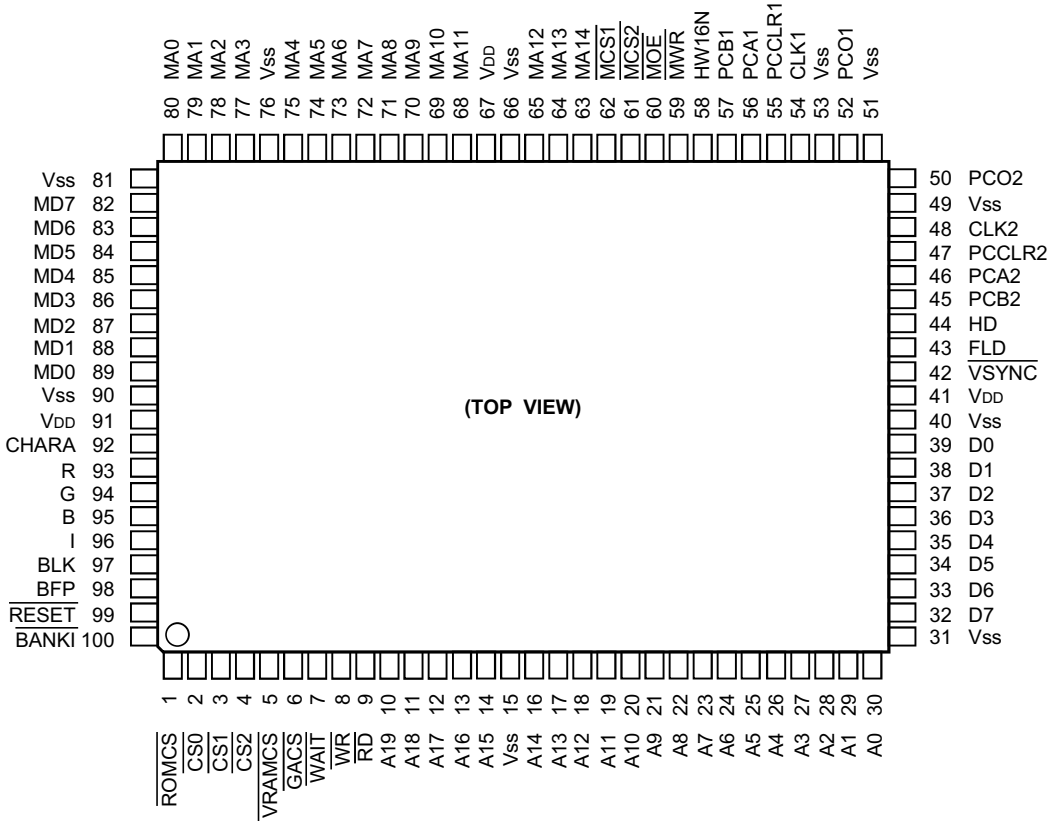
2. IC3 on the Main Board is using the Static RAM IC TC51832AFL70.

Description of this IC is as follows:



Pin	Name	I/O	Description
1	A14	I	Address signal input terminals. (15-Bit)
2	A12	I	
3	A7	I	
4	A6	I	
5	A5	I	
6	A4	I	
7	A3	I	
8	A2	I	
9	A1	I	
10	A0	I	
11	D0	I/O	Data input/output terminals. (8-Bit)
12	D1	I/O	
13	D2	I/O	
14	GND	–	Ground terminal.
15	D3	I/O	Data input/output terminals. (8-Bit)
16	D4	I/O	
17	D5	I/O	
18	D6	I/O	
19	D7	I/O	
20	$\overline{CE}$	I	Chip Enable signal input terminal.
21	A10	I	Address signal input terminal. (15-Bit)
22	$\overline{OE}$	I	Output Enable signal input terminal.
23	A11	I	Address signal input terminals. (15-Bit)
24	A9	I	
25	A8	I	
26	A13	I	
27	$\overline{WE}$	I	Write Enable signal input terminal.
28	Vcc	–	Power supply terminal.

3. IC4 on the Main Board is using the Character Generator Gate Array Logic IC TC110G110403.
Description of this IC is as follows:



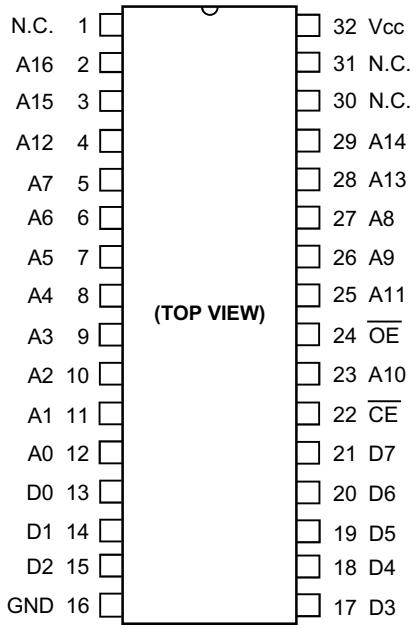
Pin	Name	I/O	Description
1	$\overline{\text{ROMCS}}$	O	Chip Select signal output terminal.
2	$\overline{\text{CS0}}$	O	Chip Select signal output terminal.
3	$\overline{\text{CS1}}$	O	Chip Select signal output terminal.
4	$\overline{\text{CS2}}$	O	Chip Select signal output terminal.
5	$\overline{\text{VRAMCS}}$	O	Chip Select signal output terminal.
6	$\overline{\text{GACS}}$	I	Chip Select signal output terminal.
7	$\overline{\text{WAIT}}$	I	Wait signal input terminal.
8	$\overline{\text{WR}}$	I	Write signal input terminal.
9	$\overline{\text{RD}}$	I	Read signal input terminal.
10	A19	I	Address signal input terminals. (20-Bit)
11	A18	I	
12	A17	I	
13	A16	I	
14	A15	I	
15	Vss	–	Ground terminal.
16	A14	I	Address signal input terminals. (20-Bit)
17	A13	I	
18	A12	I	

Pin	Name	I/O	Description
19	A11	I	Address signal input terminals. (20-Bit)
20	A10	I	
21	A9	I	
22	A8	I	
23	A7	I	
24	A6	I	
25	A5	I	
26	A4	I	
27	A3	I	
28	A2	I	
29	A1	I	
30	A0	I	
31	Vss	–	Ground terminal.
32	D7	I/O	Data input/output terminals. (8-Bit)
33	D6	I/O	
34	D5	I/O	
35	D4	I/O	
36	D3	I/O	

Pin	Name	I/O	Description
37	D2	I/O	Data input/output terminals. (8-Bit)
38	D1	I/O	
39	D0	I/O	
40	Vss	–	Ground terminal.
41	VDD	–	Power supply terminal.
42	$\overline{\text{VSYNC}}$	I	VSYNC signal input terminal.
43	FLD	I	FLD signal input terminal.
44	HD	I	HD signal input terminal.
45	PCB2	I	Phase Comparator 2 B input terminal.
46	PCA2	I	Phase Comparator 2 A input terminal.
47	PCCLR2	I	Phase Comparator 2 Clear signal input terminal.
48	CLK2	I	Clock Pulse 2 input terminal.
49	Vss	–	Ground terminal.
50	PCO2	O	Phase Comparator 2 output terminal.
51	Vss	–	Ground terminal.
52	PCO1	O	Phase Comparator 1 output terminal.
53	Vss	–	Ground terminal.
54	CLK1	I	Clock Pulse 1 input terminal.
55	PCCLR1	I	Phase Comparator 1 Clear signal input terminal.
56	PCA1	I	Phase Comparator 1 A input terminal.
57	PCB1	I	Phase Comparator 1 B input terminal.
58	HW16N	O	HW16N signal input terminal.
59	$\overline{\text{MWR}}$	O	Memory Write signal output terminal.
60	$\overline{\text{MOE}}$	O	Memory Output Enable signal output terminal.
61	$\overline{\text{MCE2}}$	O	Memory Chip Select signal output terminal.
62	$\overline{\text{MCE1}}$	O	Memory Chip Select signal output terminal.
63	MA14	O	Memory Address signal output terminal. (15-Bit)
64	MA13	O	
65	MA12	O	
66	Vss	–	Ground terminal.
67	VDD	–	Power supply terminal.
68	MA11	O	Memory Address signal output terminal. (15-Bit)
69	MA10	O	
70	MA9	O	
71	MA8	O	
72	MA7	O	
73	MA6	O	

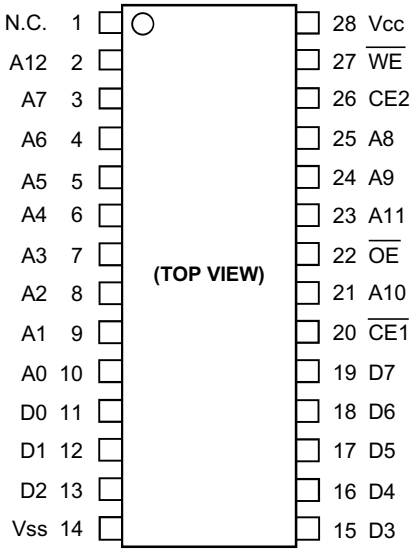
Pin	Name	I/O	Description
74	MA5	O	Memory Address signal output terminal. (15-Bit)
75	MA4	O	
76	Vss	–	Ground terminal.
77	MA3	O	Memory Address signal output terminal. (15-Bit)
78	MA2	O	
79	MA1	O	
80	MA0	O	
81	Vss	–	Ground terminal.
82	MD7	I/O	Memory Data input/output terminals. (8-Bit)
83	MD6	I/O	
84	MD5	I/O	
85	MD4	I/O	
86	MD3	I/O	
87	MD2	I/O	
88	MD1	I/O	
89	MD0	I/O	
90	Vss	–	Ground terminal.
91	VDD	–	Power supply terminal.
92	CHARA	O	Character signal output terminal.
93	R	O	R signal output terminal.
94	G	O	G signal output terminal.
95	B	O	B signal output terminal.
96	I	O	TP12 terminal.
97	BLK	O	Blanking signal output terminal.
98	BFP	O	TP11 terminal.
99	$\overline{\text{RESET}}$	I	Reset signal input terminal.
100	$\overline{\text{BANKI}}$	I	$\overline{\text{BANKI}}$ signal input terminal.

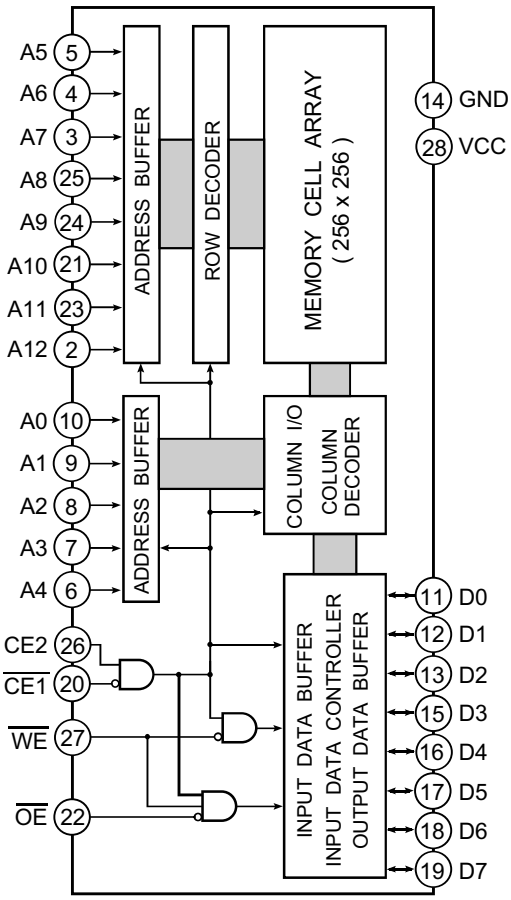
4. IC2 on the Main Board is using the ROM IC T531001FJ023.
Description of this IC is as follows:



Pin	Name	I/O	Description
1	N.C.	I	Non connection.
2	A16	I	Address signal input terminals. (17-Bit)
3	A15	I	
4	A12	I	
5	A7	I	
6	A6	I	
7	A5	I	
8	A4	I	
9	A3	I	
10	A2	I	
11	A1	I	
12	A0	I	
13	D0	O	Data output terminals. (8-Bit)
14	D1	O	
15	D2	O	
16	GND	–	Ground terminal.
17	D3	O	Data output terminals. (8-Bit)
18	D4	O	
19	D5	O	
20	D6	O	
21	D7	O	
22	$\overline{CE}$	I	Chip Enable signal input terminal.
23	A10	I	Address signal input terminal. (17-Bit)
24	$\overline{OE}$	I	Output Enable signal input terminal.
25	A11	I	Address signal input terminals. (17-Bit)
26	A9	I	
27	A8	I	
28	A13	I	
29	A14	I	
30	N.C.	I	Non connection.
31	N.C.	I	Non connection.
32	Vcc	–	Power supply terminal.

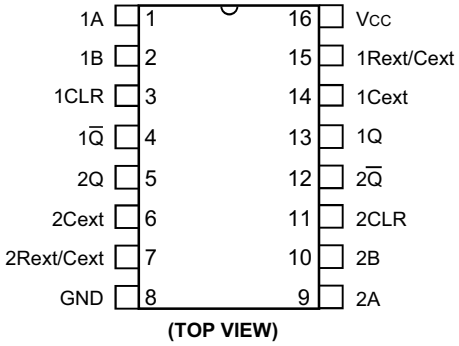
5. IC3 on the Main Board is using the 64K (8192-Word x 8-Bit) Static RAM IC LC3564SM10.
Description of this IC is as follows:





Pin	Name	I/O	Description
1	N.C.	–	Non connection.
2	A12	I	Address signal input terminals. (13-Bit)
3	A7	I	
4	A6	I	
5	A5	I	
6	A4	I	
7	A3	I	
8	A2	I	
9	A1	I	
10	A0	I	
11	D0	I/O	Data input/output terminals. (8-Bit)
12	D1	I/O	
13	D2	I/O	
14	Vss	–	Ground terminal.
15	D3	I/O	Data input/output terminals. (8-Bit)
16	D4	I/O	
17	D5	I/O	
18	D6	I/O	
19	D7	I/O	
20	$\overline{CE1}$	I	Chip Enable 1 signal input terminal.
21	A10	I	Address signal input terminals. (13-Bit)
22	$\overline{OE}$	I	Output Enable signal input terminal.
23	A11	I	Address signal input terminals. (13-Bit)
24	A9	I	
25	A8	I	
26	CE2	I	Chip Enable 1 signal input terminal.
27	$\overline{WE}$	I	Write Enable signal input terminal.
28	Vcc	–	Power supply terminal.

6. IC13 on the Main Board is using the Dual Retriggerable Monostable Multivibrators IC YWTC74HC123P.
Description of this IC is as follows:

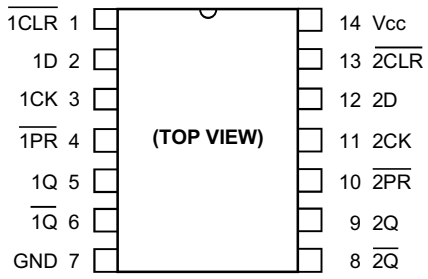


Truth Table

INPUTS			OUTPUTS	
A	B	CLEAR	Q	$\overline{Q}$
✻	✻	L	L	H
H	✻	✻	L	H
✻	L	✻	L	H
L	↑	H	⊓	⊔
↓	H	H	⊓	⊔
L	H	↑	⊓	⊔

✻ : Don't care.

7. IC14 on the Main Board is using the Dual D-FFs with Preset and Clear IC YWTC74HC74P.
Description of this IC is as follows:



Truth Table

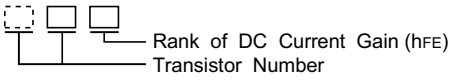
INPUTS				OUTPUTS		Function
$\overline{CLR}$	$\overline{PR}$	D	CK	Q	$\overline{Q}$	
L	H	✻	✻	L	H	Clear
H	L	✻	✻	H	L	Preset
L	L	✻	✻	H	H	——
H	H	L	↑	L	H	——
H	H	H	↑	H	L	——
H	H	✻	↓	Qn	$\overline{Qn}$	No Change

✻ : Don't care.

CHIP COMPONENTS

1. Chip Transistor

The transistor number is indicated on the top surface of the chip transistor using two alphabet letters or one numerical number and two alphabet letters.



Transistor Number

(Chip Transistor)

Letter	Transistor No.	Letter	Transistor No.
A	2SB709	X	2SD602A
B	2SB709A	Y	2SD601
C	2SB710	Z	2SD601A
D	2SB710A	1A	2SB799
E	2SA1022	1B	2SB814
F	2SA1034	1C	2SB902
H	2SA1035	1F	2SK321
I	2SB792	1K	2SK316
K	2SC2778	1L	2SK247
P	2SD814	1M	2SJ84
Q	2SD813	1N	2SK199
R	2SC2480	1O	2SK198
S	2SC2405	1T	2SC3077
T	2SC2406	1X	2SC2845
U	2SC2404	1Z	2SD1030
V	2SC2295	2B	2SK374
W	2SD602	2C	2SK116
BQ	2SB766A	UMT	2SC4081

(Small Chip Transistor)

Letter	Transistor No.
A	2SB1218
B	2SB1218A
D	2SB1219A
U	2SC3931
W	2SD1820
X	2SD1820A
Y	2SD1819
E3	2SA1226
OS	2SB1219
UC	2SA1532
YU	2SC3938

(Pair Transistor)

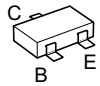
Letter	Transistor No.	Letter	Transistor No.
5R	XN1501	5H	XP4501
7S	XN1601	5C	XP4601
5H	XN4501	5H	XP4501
5C	XN4601	5L	XP5501
5L	XN5501	4N	XP5601
4N	XN5601	7S	XP6501
5N	XN6501	7W	XP6435
7W	XN6435	7F	XP6534
7F	XN6534	X1	UMX1
5R	XP1501	Z1	UMZ1
7S	XP1601		

Example:

WQ → 2SD602-Q
YQ → 2SD601-Q
1BS → 2SB814-S

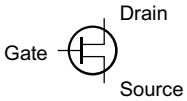
Appearance and Symbols

Transistor



C: Collector
B: Base
E: Emitter

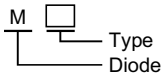
FET



	1	2	3
Eacept 2SK199	Drain	Source	Gate
2SK199	Gate	Drain	Source

2. Chip Diode

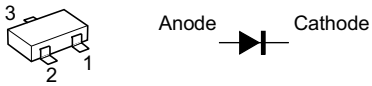
The diode number is indicated on the top surface of the chip diode using two alphabet letters.



Diode Number

Letter	Diode No.	Letter	Diode No.
MA	MA151A	MI	MA152K
MB	MA152A	MK	MA28W-B
MC	MA153	ML	MA28T-A
MD	MA28-A	MN	MA151WA
ME	MA28-B	MO	MA152WA
MF	MA28W-A	MT	MA151WK
MH	MA151K	MU	MA152WK
MH	MA141K	6.2	MA3062
MC	MA143	SMD	RD421D

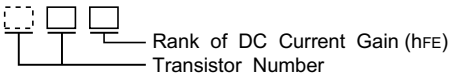
Appearance and Symbols



	1	2	3
MA28/MA28W/MA28T	–	Anode	Cathode
MA151K/MA152K	–	Anode	Cathode
MA151A/MA152A	–	Cathode	Anode
MA151WK/MA152WK	Anode	Anode	Cathode
MA151WA/MA152WA	Cathode	Cathode	Anode
MA153	Cathode	Anode	Common
MA141K	–	Anode	Cathode
MA143	Anode	Cathode	Common
MA3062	Anode	–	Cathode
RD421D	Anode	–	Cathode

3. Chip Resistor

The resistor value is indicated on the bottom surface of the chip resistor using three digit numbers.



Example:

330 → $33 \times 10^0 = 33\ \Omega$
561 → $56 \times 10^1 = 560\ \Omega$
123 → $12 \times 10^3 = 12\ k\Omega$

Note: Zero ohm resistor (jumper chip) is colored red or green.

4. Chip Capacitor

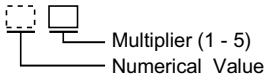
The capacitive value of replacement chip capacitors is indicated on the bottom surface. Original parts have no value indication.

If the capacitive value is less than 100 pF, the value will be indicated by one or two digit number expressing the capacity directly in pF.

Example:

0.5 → 0.5 pF 2.5 → 2.5 pF
.75 → 0.75 pF 33 → 33 pF
1 → 1 pF 82 → 82 pF

If the capacitive value is 100 pF or greater, the value will be indicated by an alpha-numeric code. The letter precedes the number and expresses a numerical value to be multiplied by the number which follows.



Numerical Value

Letter	Value	Letter	Value
A	10	N	33
B	11	P	36
C	12	Q	39
D	13	R	43
E	15	S	47
F	16	T	51
G	18	U	56
H	20	V	62
J	22	W	68
K	24	X	75
L	27	Y	82
M	30	Z	91

* Letters I and O are not used.

Example: A1 → 10×10^1 = 100 pF

N2 → 33×10^2 = 3300 pF

S3 → 47×10^3 = 47000 pF

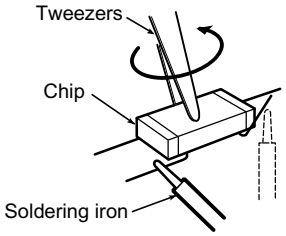
5. Precautions in replacing the chip component

1. Make sure that the unit is turned OFF when replacing the chip.
2. Use tweezers to prevent any damage to the chip surface.
3. Do not re-use the chips after removal.
4. Do not rub the electrode of chips.
5. Do not subject the chips to excessive stress.
6. It is recommended that a pencil-type soldering iron to be used.
7. The solder whose diameter is less than 0.5 mm is recommended.
8. Do not heat the chip more than 3 seconds.
9. Maintain temperature control under 260°C (500°F) when soldering.

5-1. Removal (Transistor, Diode, Resistor and Capacitor)

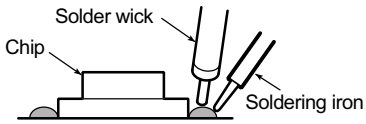
1. Add the solder to both ends of the chip (three leads for chip transistor).
2. While attaching the soldering iron to both ends of the chip (three leads for chip transistor) as shown below, remove the chip by turning with tweezers.

Note: Be careful not to damage other chips.

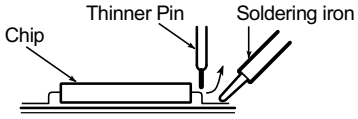


5-2. Removal (IC)

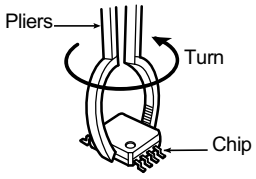
1. Add the solder wick and soldering iron to each lead of the IC and remove solder.



2. Add the soldering iron to each lead of the IC and left each lead of the IC using thinner pin.

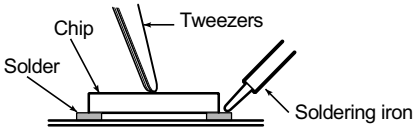


3. Remove the IC turning with pliers.

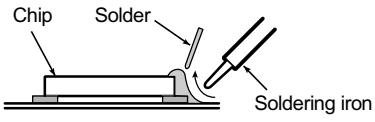


5-3. Mounting

1. Place the solder thinly on the chip mounting foil.
2. Solder the chip temporarily while holding the chip with the tweezers.

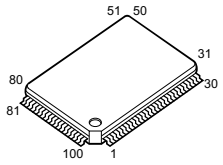


3. Solder both ends of the chip (three leads for chip transistor).

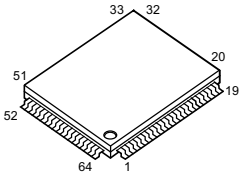


APPEARANCE OF IC, TRANSISTOR AND DIODE

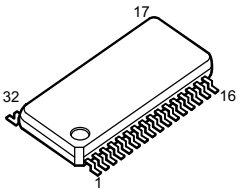
TC110G110403



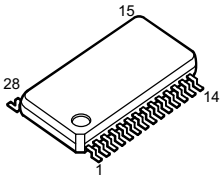
TMP90C041AF



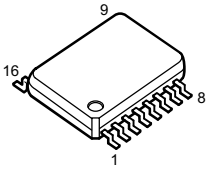
T531001FJ023



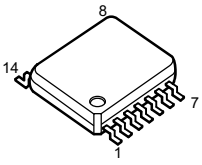
LC3564SM10
TC51832AFL70



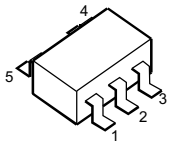
YWTC74HC123P



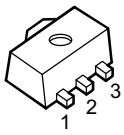
TC74HC08AF
TC74HCU04AF
TC74HC00AF
YWTC74HC74P



TA75S393

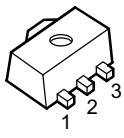


TA7805F



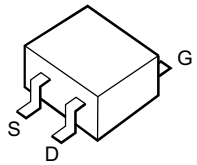
1: Input
2: GND
3: Output

RH5VA42A

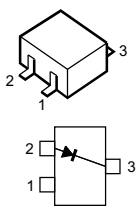


1: Input
2: Vcc
3: GND

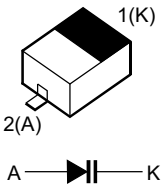
2SK209GR



1SS294
MA3150M



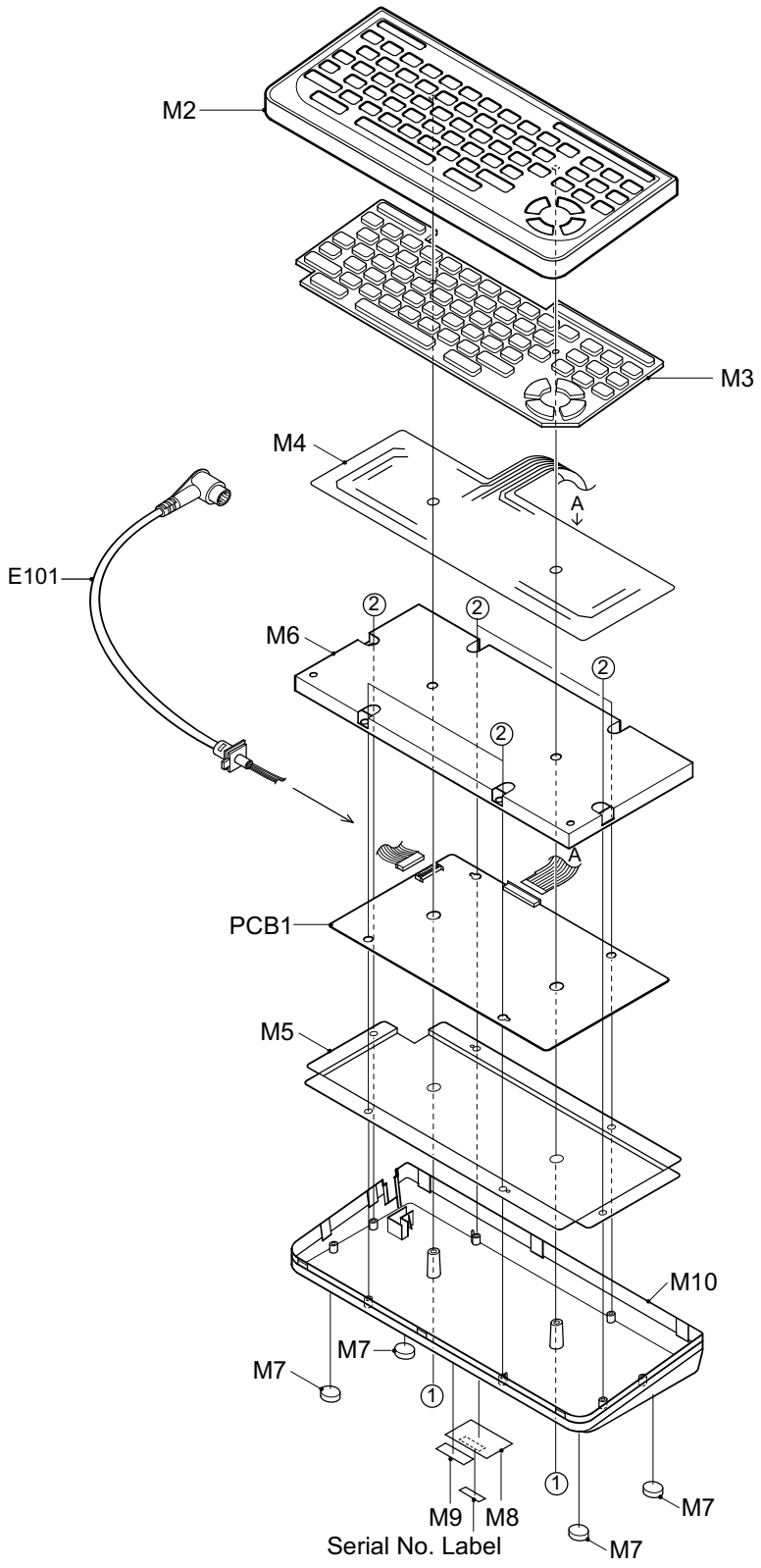
1SV214

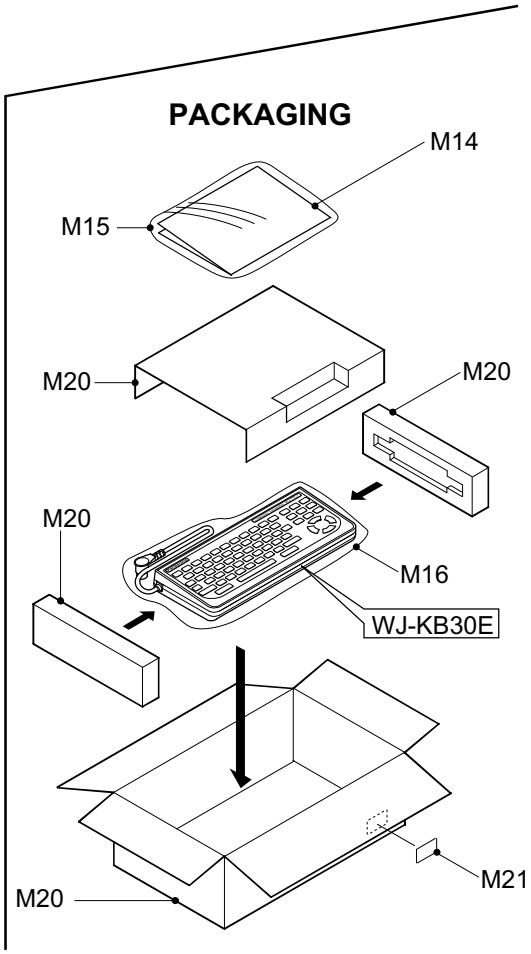


EXPLODED VIEW

○ Numbers show screws, washers nuts and etc.

No.	Screw	Description
①	XTN2+6FX	Pan Head Tapping Black Screws
②	XTN26+8FX	Pan Head Tapping Black Screws





REPLACEMENT PARTS LIST

Important Notice

1. Components identified by " ⚠ " mark have special characteristics important for safety.
   When replacing any of these components, use only manufacturer's specified parts.
2. RTL : Retention Time Limited,

REF.NO.	PART NO.	DESCRIPTION
MISCELLANEOUS		
E101	MU15CD846	Cable Connector Assy
M2	MU15CS835PA	Upper Case
M3	MU15CT837PA	Rubber Contact
M4	MU15FS842	KEY Flexible Board
M5	MU15SF839	Shield Cover A
M6	MU15SF840	Shield Cover B
M7	MU15GL817	Rubber Food
M8	MU15LB841EC	Main Label
M9	YWV7SA1634A4	Micom System Label
M10	MU15CS836PA	Bottom Case

REF.NO.	PART NO.	DESCRIPTION	
MAIN BOARD			
PCB1 (RTL)	MU15VPB419	Printed Circuit Board Assy	
IC1	TMP90C041AF	IC	
IC2	T531001FJ023	IC	
IC3	LC3564SM10	IC	
IC4	TC110G110403	IC	
IC5,6	TC51832AFL70	IC	
IC7	TC74HC08AF	IC	
IC8	TA7805FTE16	IC	
IC9	RH5VA42AAT1	IC	
IC10	TC74HCU04AF	IC	
IC11	TC74HC004AF	IC	
IC12	TA75S393T85R	IC	
IC13	YWTC74HC123P	IC	
IC14	YWTC74HC74P	IC	
Q1,2	2SK209-GR	Transistor	
D1	ISS294TE85R	Diode	
D2,3	ISV214	Varistor	
D5	MA3150	Diode	
R1	ERJ6GEY104	Carbon	100K ohms 1/6W
R2-4	ERJ6GEY101	Carbon	100 ohms 1/6W
R5	ERJ6GEY104	Carbon	100K ohms 1/6W
R6	ERJ6GEY101	Carbon	100 ohms 1/6W
R7-9	ERJ6GEY101	Carbon	100 ohms 1/6W
R10	ERJ1WYJ220	Carbon	22 ohms 1W
R11	ERJ6GEY104	Carbon	100K ohms 1/6W
R12	ERJ6GEY101	Carbon	100 ohms 1/6W
R13	ERJ6GEY102	Carbon	1K ohms 1/6W
R14	ERJ6GEY105	Carbon	1M ohms 1/6W
R15	ERJ6GEY104	Carbon	100K ohms 1/6W
R16	ERJ6GEY332	Carbon	3.3K ohms 1/6W
R17	ERJ6GEY681	Carbon	680 ohms 1/6W
R18	ERJ6GEY682	Carbon	6.8K ohms 1/6W
R19	ERJ6GEY101	Carbon	100 ohms 1/6W
R20	ERJ6GEY102	Carbon	1K ohms 1/6W
R21	ERJ6GEY105	Carbon	1M ohms 1/6W
R22	ERJ6GEY104	Carbon	100K ohms 1/6W
R23	ERJ6GEY332	Carbon	3.3K ohms 1/6W
R24	ERJ6GEY681	Carbon	680 ohms 1/6W
R25	ERJ6GEY682	Carbon	6.8K ohms 1/6W
R26	ERJ6GEY561	Carbon	560 ohms 1/6W
R27	ERJ6GEY512	Carbon	5.1K ohms 1/6W
R28	ERJ6GEY103	Carbon	10K ohms 1/6W
R29,30	ERJ6GEY273	Carbon	27K ohms 1/6W
R31	ERJ6GEY104	Carbon	100K ohms 1/6W
R32	ERJ6GEY103	Carbon	10K ohms 1/6W

REF.NO.	PART NO.	DESCRIPTION	
R33	ERJ6GEY393	Carbon	39K ohms 1/6W
R34	ERJ6GEY473	Carbon	47K ohms 1/6W
R35	ERJ6GEY104	Carbon	100K ohms 1/6W
NR1-4	EXBV8V101J	Block Resistor	
NR5,6	EXBH9E104J	Block Resistor	
C1-6	ECUX1H103KBG	Ceramic	0.01 µF 50V
C7,8	ECUV1H240JCN	Ceramic	24 pF 50V
C9	ECUX1H103KBG	Ceramic	0.01 µF 50V
C10	ECUX1H471JCG	Ceramic	470 pF 50V
C11-13	ECUV1H681JCX	Ceramic	680 pF 50V
C14	ECUX1H470JCV	Ceramic	47 pF 50V
C15	ECUV1H151CG	Ceramic	150 pF 50V
C16	ECUV1H272JCX	Ceramic	2700 pF 50V
C17	ECUV1H390JCG	Ceramic	39 pF 50V
C18	ECUV1H151CG	Ceramic	150 pF 50V
C19	ECUV1H272JCX	Ceramic	2700 pF 50V
C20,21	ECUX1H103KBG	Ceramic	0.01 µF 50V
C24	ECUX1H103KBG	Ceramic	0.01 µF 50V
C25	ECUV1H681JCX	Ceramic	680 pF 50V
C26	ECUX1H102JCG	Ceramic	1000 pF 50V
C27	ECUX1H103KBG	Ceramic	0.01 µF 50V
C28	ECUV1H122JCX	Ceramic	1200 pF 50V
C29	ECUX1H103KBG	Ceramic	0.01 µF 50V
C30	ECUX1H561JCX	Ceramic	150 pF 50V
C31,32	ECUX1H103KBG	Ceramic	0.01 µF 50V
EC1	ECEV1CG220GP	Electrolytic	22 µF 16V
EC2	EECS5R5H105	Electrolytic	1 µF 5.5V
EC5,6	ECEV1HG2R2GR	Electrolytic	2.2 µF 50V
EC7,8	ECEV1CG470GP	Electrolytic	47 µF 16V
EC9	ECEV1CG220GP	Electrolytic	22 µF 16V
X1	AS7394SLA1	Crystal Oscillator	16 MHz
L3,4	E1C4EJ013EC	Coil	
CN1	YWS10BPHKS	10-pin Connector	
CN2	SFW20R5STE1	20-pin Connector	

REF.NO.	PART NO.	DESCRIPTION
ACCESSORY PARTS/PACKAGING PARTS		
M14	YWV8QA3369AN	Operating Instructions
M15	YWT20X35C03	Polyethylene Bag
M16	XZB19X50B04P	Polyethylene Bag
M20	EMU15SVPC006	Packaging Assy

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